Amendments to the Drawings:

Applicants submit a set of replacement drawings with this Amendment.

REMARKS

In the Office Action dated September 10, 2009, the disclosure and drawings are objected to. The claims are rejected under 35 USC §112, second paragraph and under 35 USC § 103(a).

In view of the amendment to the specification and claims, and the resubmission of replacement drawings, and for the following reasons, it is respectfully submitted that Applicants' invention as set forth in the claims and described and illustrated in the specification and drawings is particularly pointed out and distinctly claimed and, further, includes features which are not suggested or rendered obvious by the cited references, taken in any permissible combination. Reconsideration is, therefore, respectfully requested.

The disclosure is objected to for various informalities. Accordingly, the specification has been revised to provide consistent term and symbol usage throughout the specification and with the drawings.

The disclosure is also objected to on the basis that all reference labels which appear in a drawing figure should be correspondingly described in the specification.

Accordingly, the specification has been amended to include all reference labels in the drawing figures. It should be noted that figures 13, 14, and 15 are similar to figurers 1, 2 and 3 such that reference labels appearing figures 13, 14, and 15 are not described in the specification as they have been previously discussed in connection with figures 1, 2, and 3.

The specification has also been revised to provide a generic term for the trademark RT/DUROID. Applicants' point out that the generic terminology for the product sold under the RT/DUROID trademark is a high frequency laminate substrate. The RT/DUROID product is

generically described by the manufacturer as a particular type of substrate.

The generic term "substrate" is already presented in the specification and should overcome this objection. Accordingly, it is respectfully submitted that all objections have been overcome.

Labels described in the specification which do not appear in the drawing are correctly described as "not shown in drawing." However, the portion of the array that corresponds to the label which is not shown in the figure is submitted to be clear from the description.With respect to the graphs depicted in figures 4, 5, 6, 8, 10 etc., it is respectfully submitted that the specification provides an adequate description of the important features and aspects of the curves in each graph. It is submitted that one of ordinary skill in the art of phased arrays would clearly understand the nature and important features of the curves in each graph based on experience in this field.

The drawings are objected to. Accordingly, Applicants submit another replacement set of drawings which are submitted to address the poor quality objection raised by the Examiner.

It is further submitted that the amendments to the specification obviate the need to change the reference labels in Fig. 13 as noted by the Examiner in the Office Action.

Claims 34, 40, 35-39 and 41 are rejected under 35 USC § 112, second paragraph. The claims have been amended to incorporate the Examiner's suggestions as well as to provide consistent term usage and proper antecedent basis for all claim terms. As such, it is respectfully submitted that Applicants' invention as set forth in the claims as particularly pointed out and distinctly claimed as required by 35 USC § 112, second paragraph.

REJECTION A

Claims 34, 40, 35-39 and 41 are rejected under 35 USC § 103(a) as being unpatentable over Kirino in view of Mantele. The Examiner contends that Kirino teaches most of the features of Applicants claimed invention except that Kirino does not explicitly disclose first series tunable elements and second tunable elements parallel connected to a respective antenna.

The Examiner cites Mantele for disclosing a phase shifter comprising a transmission line defined by serially align distributed parameters and parallel connected varactors. The Examiner contends that the transmission of Mantele is considered "tunable" by virtue of being designed to a different inductive reactance and where the varactors are considered "tunable" by the application of a control voltage to change the capacitance of the varactor. The Examiner also contends that the series connected inductors of Mantele would necessarily provide an impedance in version from one end to the other end.

ARGUMENT A

Mantele shows in Figure 1 a single stage varactor controlled phase shifter device. Kirino discloses a multiple stage phased array antenna. If Mantele is combined with Kirino, as suggested by the Examiner, the terminals 51A, B, and 53 A, B of Mantele would have to be inserted between each stage of Kirino, such as between element 809 and the second matching device 812 as a replacement for the matching device 812, the antenna 804Aand the phase shifter 805A. This replacement would have to be repeated for each stage of Kirino. As shown in Figure 1 of Mantele, each section of the transmission line includes multiple varactors.

Therefore, to achieve a significant phase shift, a transmission line with significant electrical length is needed. Therefore, many sections would have to be used to achieve a significant phase shift, each containing multiple varactors.

Kirino teaches fixed, non-tunable matching circuits. Thus, Kirino is not able to cope with the variation of line impedance. The characteristic impedance variation and the phase shifter will result in unequal power distribution across Kirino's array if Mantele's phase shifter is combined with Kirino.

Applicants' extended resonance circuit not only uses a very limited number of tunable impedances, as opposed to tens or hundreds of tunable elements in Mantele, but it also maintains the exact impedance match across the ports. In other words, as the tunable elements are varied in Applicants extended resonance circuit, equal power distribution remains unchanged. Therefore, any tuning change in the capacitance is not a limitation to equal power division and phase shifting.

REJECTION B

The Examiner concludes that it would have been obvious in view of Kirino and Mantele, taken as a whole, to have realized the series connection of phase shift elements in the phased array antenna of Kirino by a series connected phase shift configuration as taught by figure 1 of Mantele. The Examiner contends that such a modification would have been considered an obvious substitution of art recognized equivalence series connected phase shift configurations, thereby suggesting the obviousness of such a modification.

The Examiner further notes that the series of connections of plural phase shift elements as taught by Mantele would obviously have been compatible with the series connection of the generic phase shift elements of Kirino.

ARGUMENT B

Mantele's phase shifter cannot automatically be combined with Kirino's design because Kirino suggests fixed, non-tunable matching circuits. Thus, the matching circuit of Kirino will not able to cope with variation of line impedance. Hence, characteristic impedance variations and a phase shift will result in unequal power distribution across Kirino's array when combined with Mantele as posed by the Examiner.

The non-equivalence of Mantele and Kirino is further demonstrated by the fact that if an identical phase shift design is desired throughout Kirino's array, the antennas and/or matching network would have to be designed separately for each stage. Applicants' extended resonance circuit uses the same antenna design with matching networks specifically designed for each stage of the array.

Kirino's phased array cannot use the same antenna design, the same phase shifter design, and a same matching network throughout. At least one of these three elements would have to be designed separately for each section of the phased array.

On the contrary, Applicants' extended resonance network uses the same antenna design with no matching network which provides a design that can be scaled to any size array.

REJECTION C

The Examiner further notes that while Kirino does not explicitly disclose the transforming of admittance to the conjugate impedance at each antenna port, by virtue of selecting the impedance and thus the admittance of the antenna and the impedance matching circuit, those of ordinary skill in the art would have found it obvious to have selected a conjugate admittance as a desirable impedance characteristic especially since selecting the conjugate admittance would necessarily compensate for the imaginary component of the impedance, thereby leaving the real component of impedance at each antenna port.

ARGUMENT C

The Examiner acknowledges that Kirino (and Mantele by inference) are completely devoid of any recognition of use of the conjugate admittance as part of the phase shift and power division for each antenna cell or port. While one skilled in the art of electrical circuit design would necessarily know that admittance is the inverse of impedance, the references are silent of any teaching or suggestion of how one of ordinary skill in the art, in the absence of Applicants' invention, would choose an impedance between each port which transforms the admittance of one port and all downstream ports to its conjugate. The prior art lacks any use of conjugate admittance in a phased antenna array.

The Examiner contends that one of ordinary skill in the art would select the conjugate admittance to compensate for the imaginary component of the impedance thereby leaving the real component of impedance at each antenna port is clearly a result of the hindsight reconstruction using Applicants' invention as a basis for reaching such a conclusion.

The Examiner may be confusing conjugate admittance with conjugate matching in circuit design. The transformation of impedance to its conjugate has nothing to do with the practice of conjugate admittance in an extended resonance circuit. Applicants are not matching their circuit until the very last element in the element in the chain. Impedance matching requires that the impedance of the load should be the conjugate of the impedance of the source. However, this impedance matching has nothing to do with Applicants' circuit.

Thus, the Examiner's basis for this rejection is submitted to be in error.

In conclusion, for the reasons set forth above, taken in combination with the amendments to the claims and specification, it is respectfully submitted that all objections and rejections have been overcome. Accordingly, claims 10, 34, 40, 41 and 35-39 are submitted to be in condition for allowance; a notice of which is respectfully requested.

After the Examiner has had an opportunity to review this amendment, he is invited to contact Applicants' attorney to arrange telephone interview with Applicants' attorney and the inventor, as discussed between Applicants' attorney and the Examiner prior to the filing of this amendment.

Respectfully submitted,

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